SCHWIMMBAD .::. WHIRLPOOL .::. INFRAROT-KABINEN

Pooldoktor® Handels GmbH

Technical Service Manual

SWIMMING POOL HEAT PUMP

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Chapter 1: Generalization

I Introduction

This product is for swimming pool heating and cooling based on principle of vapor compression hot pump. Refrigerant in the outdoor evaporator (heat collector) will be gasified after absorbing heat from air, then the compressor will send gaseous refrigerant from the evaporator to Titanium Heat Exchanger, which will transfer heat/cold to pool water to keep it in demanded constant temperature. Since the electricity is not conversed to heat directly like heating wire but moves heat from air to water, it is very cost-efficient. Except for little operating noise, there is no hazard to the environment. It is a green, energy-saving and safe product that will substitute for traditional heaters.

II Product Range

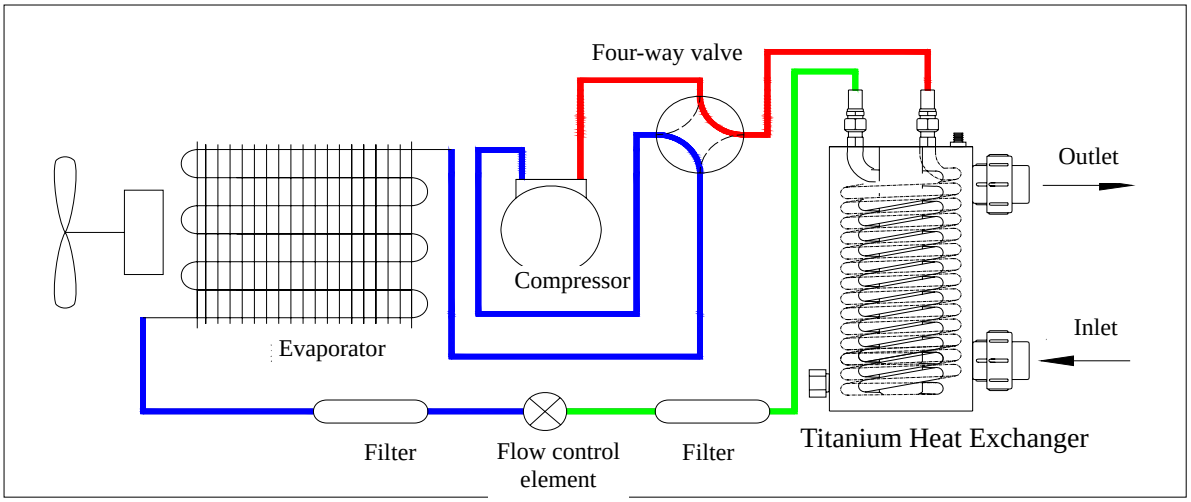
Vertical Type (Top Fan)	Type	Dimension（L×W×H）	Remark
	PH(C)20V	567×550×640	Metal casing
	PH(C)30V	689×694×740	Metal casing
	PH(C)45V	689×694×740	Metal casing
	PH(C)60V(s)	689×694×740	Metal casing
	PH(C)75Vs	740×694×950	Metal casing
	PH(C)180Vs	1425×830×1290	Metal casing

Horizontal Type (Side Fan)	Type	Dimension（L×W×H）	Remark
	PH15	930×350×550	Metal casing
	PH(C)20	930×350×550	Metal casing
	PH(C)30	1000×350×630	Metal casing
	PH(C)31B	850×350×625	Plastic casing
	PH(C)45	1000×380×730	Metal casing
	PH(C)60(s)	1120×470×950	Metal casing
	PH(C)75s	1180×470×950	Metal casing

Note: PH is single heat type, PHC is heating and cooling type and S refers to three-phase line.

III Product diagram

The air source heat pump for swimming pool is mainly consisted of compressor, evaporator, throttling element, filter and Titanium Heat Exchanger



IV Comparison among water heater units

Type / Item	Heat pump unit	Electric water heater	Oil water heater	Gas water heater
Energy	Electric	Electric	Diesel oil	LPG
Energy calorifics value	860Kcal/℃	860K/℃	10200Kcal/kg	24000Kcal/m
Average efficiency	600％	95％	80％	80％
Energy consumption	21．37kwh	134．64 kwh	13．48kg	5.73m³
Noise	Small	Small	Large	Middle
Environment effects	None	None	Severe	Some
Safe	**Safe**	Electric shock caused by aged tubular electric heating element	Oil leakage, risk of fire and explosion	Gas leakage, risk of fire and explosion

Note: heat 10000kg water from 15℃ to 26℃:

10000 ㎏×（26-15）×1Kcal/kg＝110000Kcal

V Safety

Please read the manual carefully for correct operation and avoiding hazards to human body and property.

1. Warning

a Pool heating must be installed by a skilled team. Users must not install it independently because it could cause injury, or damage to the equipment.

b Earth the equipment correctly

c It must be installed in a place with good ventilation to avoid risk of asphyxiation when refrigerant leakage exceeds limit.

2. Operation warning

a Never put finger or stick into the fan grill.

b In case of any abnormity such as empyreuma, please cut off main power supply and contact the dealer.

c Never modify or repair by yourself.

3. Precaution for installation

a Never install this unit at the place where inflammable gas is existed.

b The foundation for installation should be firm.

c There should be a circuit breaker installed separately from the power supply end.

d Never Substitute other conductor for fuse.

4. Precaution for operation

a Make sure the installation stand is firm enough for long time operation.

b Cut off power supply before cleaning, use soft cloth but never clean with water directly.

c Do not spray flammable solvent to the machine directly.

Chapter 2: Performance and specification

I Specification and parameter

1. Horizontal Type (Side Fan)

Model		PH15	PHC20	PHC30	PHC45	PHC60	PHC60s	PHC75s
Function	Heating capacity KW (air 26℃,water 26℃)	6	9	12	16	23	23	30
	C.O.P. (air 26℃,water 26℃)	≥6.0	≥6.0	≥6.0	≥6.0	≥6.0	≥6.0	≥6.0
	Heating capacity KW (air 15℃,water 26℃)	4.5	6.3	8.5	11	16	16	21
	C.O.P. (air 15℃,water 26℃)	≥4.5	≥4.5	≥4.5	≥4.5	≥4.5	≥4.5	≥4.5
	Cooling Capacity (KW) (air 35℃, water 28℃)	/	5.5	7.5	9.5	14	14	18
	C.O.P.（air 35℃, water 28℃)	/	≥3.8	≥3.8	≥3.8	≥3.8	≥3.8	≥3.8
	Rated power/ Max power Kw	0.93/1.4	1.4/1.8	1.8/2.4	2.4/3.1	3.8/5.6	3.8/5.6	4.5/6.3
	Power supply	220-240V/1Ph/50Hz or 60Hz					380-415V/3Ph/50Hz or 60Hz	
	Rated current / Max current A	4.6/6.4	6.4/8.2	8.2/11.0	10.9/14.1	17.3/26	5.8/8.5	6.8/9.6
	Noise level dB(A)	≤48	≤48	≤48	≤50	≤56	≤56	≤58
	Net weight / Gross weight Kg	45/50	52/57	66/70	85/93	127/137	127/137	150/160
Water pipe in-out spec mm		50	50	50	50	50	50	50
Advised water flux m³/h		3-4	4-6	5-7	6.5-8.5	8-10	8-10	10-12

2. Vertical Type (Top Fan)

Model		PHC20v	PHC30v	PHC45v	PHC60v	PHC60vs	PHC75vs
Function	Heating capacity KW (air 26℃,water 26℃)	9	12	16	23	23	30
	C.O.P. (air 26℃,water 26℃)	≥6.0	≥6.0	≥6.0	≥6.0	≥6.0	≥6.0
	Heating capacity KW (air 15℃,water 26℃)	6.3	8.5	11	16	16	21
	C.O.P. (air 15℃,water 26℃)	≥4.5	≥4.5	≥4.5	≥4.5	≥4.5	≥4.5
	Cooling Capacity (KW) (air 35℃, water 28℃)	5.5	7.5	9.5	14	14	18
	C.O.P. (air 35℃, water 28℃)	≥3.8	≥3.8	≥3.8	≥3.8	≥3.8	≥3.8
	Rated power/ Max power Kw	1.4/1.8	1.8/2.4	2.4/3.1	3.8/5.6	3.8/5.6	4.5/6.3
	Power supply	220-240V/1Ph/50Hz or 60Hz				380-415V/3Ph/50Hz or 60Hz	
	Rated current / Max current A	6.4/8.2	8.2/11.0	10.9/14.1	17.3/26	5.8/8.5	6.8/9.5
	Noise level dB(A)	≤48	≤48	≤50	≤56	≤56	≤58
	Net weight / Gross weight Kg	55/60	70/75	85/93	105/115	107/117	127/137
Water pipe in-out spec mm		50	50	50	50	50	50
Advised water flux m³/h		4-6	5-7	6.5-8.5	8-10	8-10	10-12

II Relation between unit capability and temperature of outdoor environment and pool water

Ambient temperature℃ / Pool water temperature℃	5	10	15	20	25	26	30	35
10	0.73	0.86	1.02	1.2	1.42	1.47	1.68	1.99
15	0.65	0.77	0.9	1.07	1.26	1.3	1.49	1.75
20	0.57	0.68	0.8	0.94	1.11	1.15	1.31	1.55
25	0.51	0.6	0.71	0.84	0.99	1.02	1.17	1.39
26	0.5	0.59	0.7	0.83	0.98	1	1.16	1.36
30	0.45	0.53	0.62	0.73	0.87	0.9	1.03	1.21
35	0.4	0.47	0.55	0.65	0.77	0.7	0.91	1.07

Chapter 3: Installation

I Right Place for installation

1. Adequate room for installing and maintaining.
2. No obstacle at air inlet and outlet, no strong wind.
3. Dry and well ventilated.
4. Even & solid ground for horizontal installation, does not increase noise and vibration.
5. Where operating noise and exhausting air have no effects to neighbors.
6. No flammable gas leakage.
7. Where it is convenient to install connecting pipe and appliances.

II Precaution

1 The following places may cause machine failure

a Places with mineral oil like cutting machine oil.

b Too much salt in air, like seaside.

c Severe voltage fluctuation such as factories.

d With too much oil gas and oil splash such as the kitchen.

e With strong electromagnetic wave.

f With flammable gas and material.

g With evaporation of acid or alkaline gas.

h Other special environment.

2 Precaution before installation

a Transport it in original package.

b If the machine is installed on metal parts of the building, please insulate well and make it comply with relative technical codes.

III Key emphasis in work

1 Installation

Check the machine mode and type again to avoid wrong installation.

2 Wiring

a. Connect equipment to corresponding mains. The voltage must correspond with the product's specified voltage.

b. Earth the equipment correctly

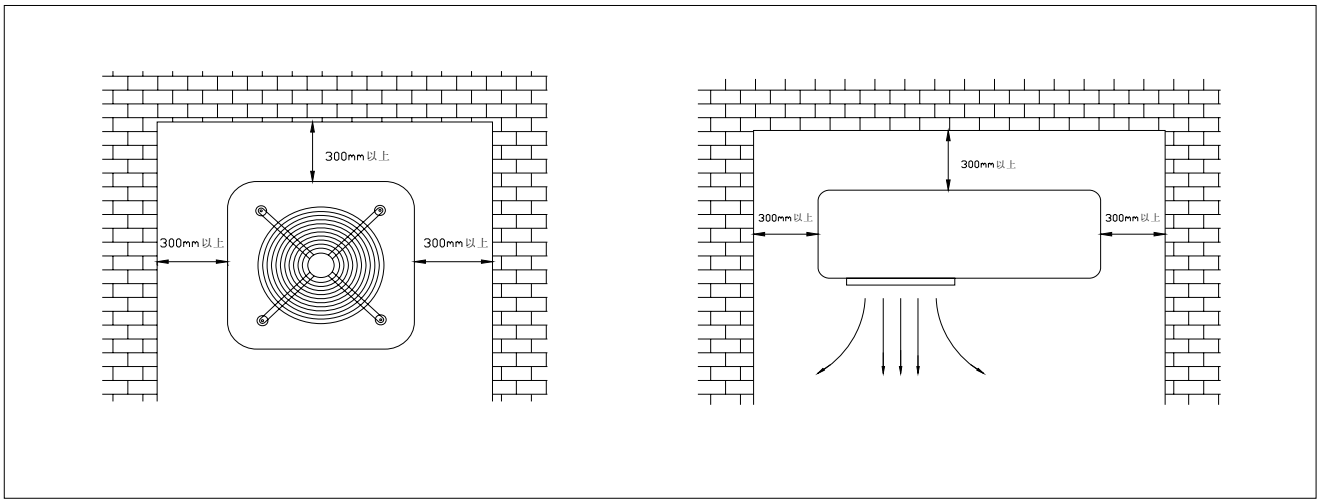
c. Install protection (circuit breaker) against leakage current according to your local regulations.

3 Machine pipeline connection

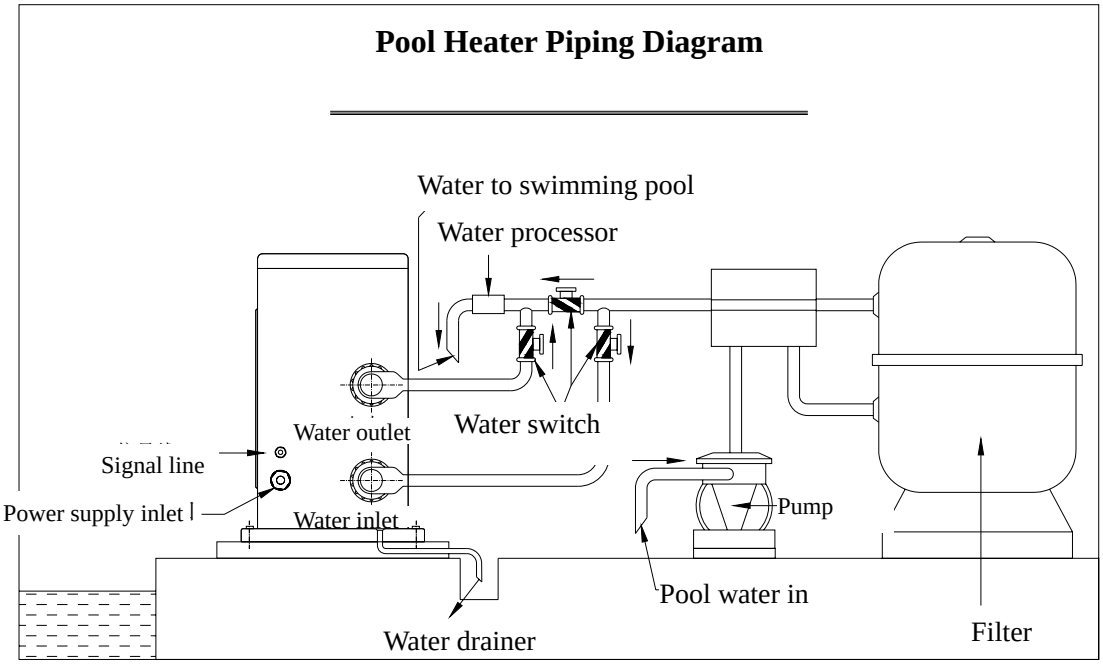
Attention!!! Titanium heat exchanger joint cannot support the piping system's e weight directly.

4 Installing space

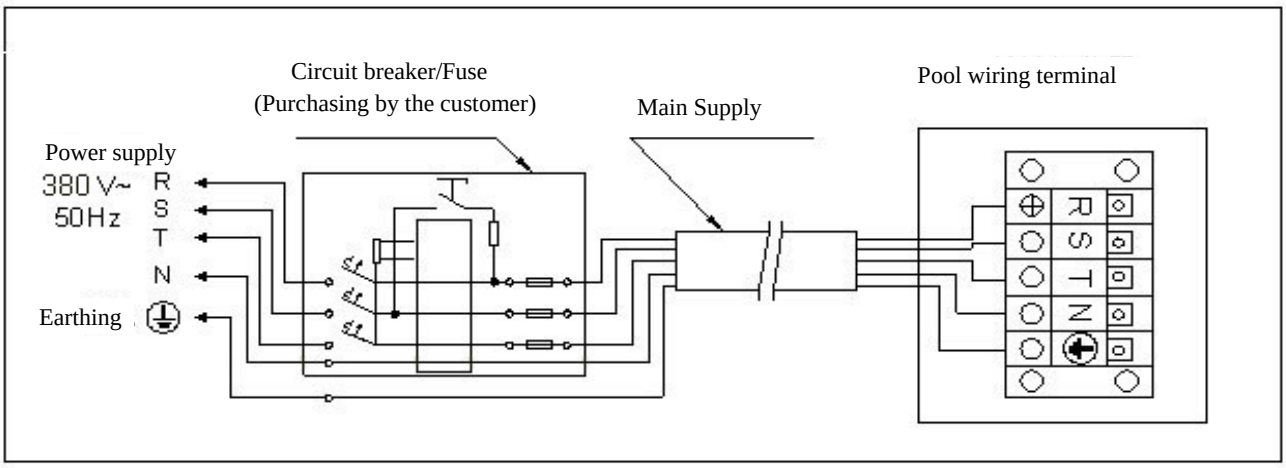
When installation, please leave enough space (30 CM away from each side Refer to the following)

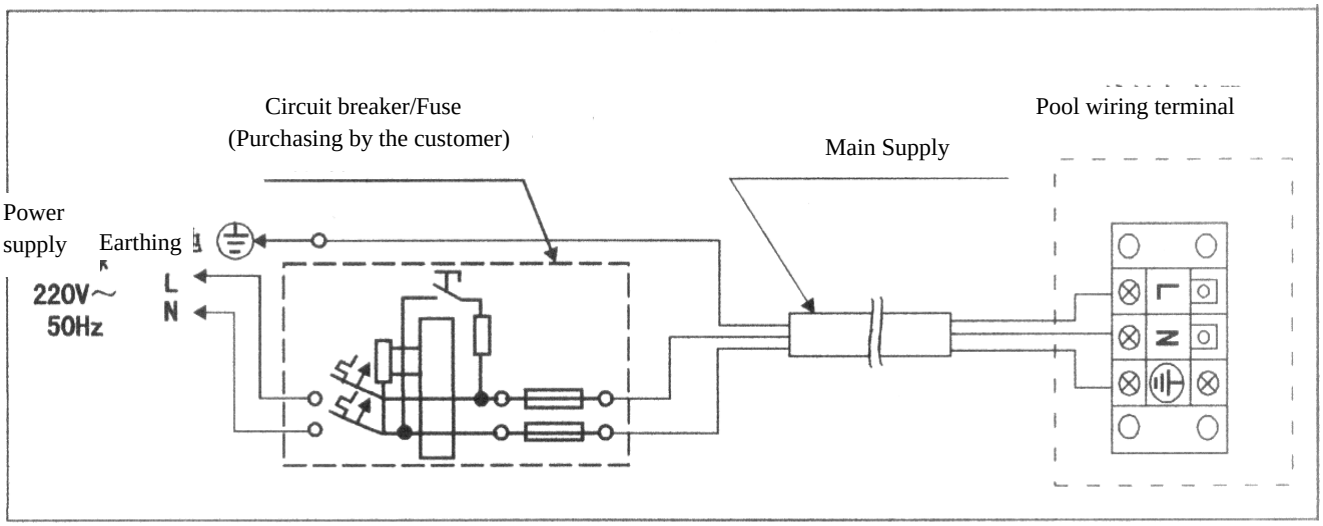


IV Diagram of water piping connections



V Electric connections diagram





MODEL		PHC20V	PHC30V	PHC45V	PHC60V	PHC60Vs	PHC75Vs
Breaker	Rated Current A	15	20	25	40	15	20
	Rated Residual Action Current mA	30	30	30	30	30	30
Fuse A		15	20	25	40	15	30
Power Cord（mm^2）		3×2.5	3×2.5	3×4	3×6	5×2.5	5×4
Signal cable（mm^2）		3×0.5	3×0.5	3×0.5	3×0.5	3×0.5	3×0.5

MODEL		PH15	PHC20	PHC30	PHC45	PHC60	PHC60s	PHC75s
Breaker	Rated Current A	15	15	20	25	40	15	20
	Rated Residual Action Current mA	30	30	30	30	30	30	30
Fuse A		15	15	20	25	40	15	30
Power Cord（mm^2）		3×2.5	3×2.5	3×2.5	3×4	3×6	5×2.5	5×4
Signal cable（mm^2）		3×0.5	3×0.5	3×0.5	3×0.5	3×0.5	3×0.5	3×0.5

Noted: The information above is for a mains cable of ≤ 10 m. If the mains cable is ≥ 10 m,
The conductor diameter must be increased. The signal cable can be a maximum of 50m long.

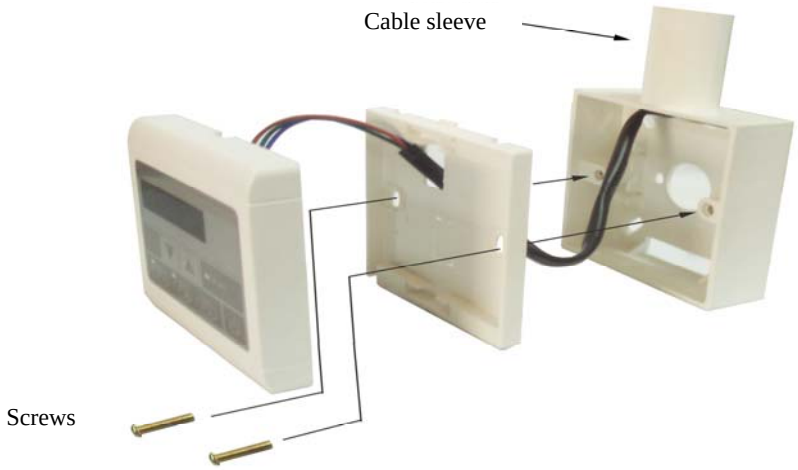
VI Installation and operation of LED controller

1 Check the following fittings of the controller are available.

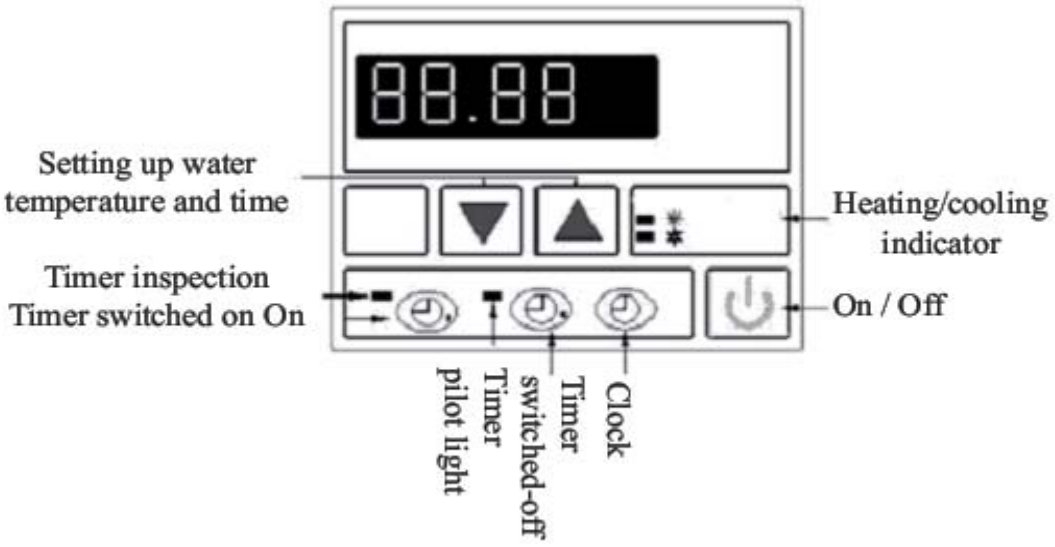
a. LED controller 1pcs

b. Bottom box of line controller 1pcs

2 Installation diagram



3 Operation Instruction



CLOCK TIME ON TIME OFF COOL HEAT

a. Operating display

A. The display shows the time when the equipment is off

B. The display shows water temperature in the pool when the equipment is on.

b. Mode setting

In switch on condition, press MODE, Heat ,Cool indicators will light up accordingly, if heat indicator is on, it is in heating condition, if the cool indicator is on, it is in cooling condition.

c. Water temperature setting

A. This function is accessible regardless of the equipment is on or off.

B. To set the water temperature, press the button or The temperature will flash on the controller. Press the button to adjust to the required water temperature or .

C. After 5 seconds, the regulator display returns to its normal mode.

d. Time setting

A. This function is accessible regardless of whether the equipment is on or off.

B. To set the time, press the button when the time on screen begins to flash, press the button again to set hours. Adjust the value with the button and .Before the time stops flashing, press the button for adjusting minutes. Adjust the value with the button and .After adjustment, press the button and water temperature will be displayed. After 30 seconds, the regulator display returns to its normal mode.

e. Timer on and off

A. Set timer to switch on the machine, press the button . When the pilot light turns on and begins to flash, press the button again to adjust hours. Adjust the value with the button and .Before the time stops flashing, press the button for adjusting minutes. Adjust the value with the button and .After adjustment, press the button “TIMER ON” and water temperature will be displayed. After 30 seconds, the regulator display returns to its normal mode.

B. Set timer to switch off the machine, press the button When the pilot light turns on and begins to flash, press the button again to adjust hours. Adjust the value with the button and .Before the time

stops flashing, press the button for adjusting minutes. Adjust the value with the button and .After adjustment, press the button and water temperature will be displayed. After 30 seconds, the regulator display returns to its normal mode.

f. Cancel the timer

Press the button or .When the displayed information starts to flash, press the button , when the timer pilot light is off and water temperature is shown on the display, the timer has been cancelled. After 30 seconds, the regulator display returns to its normal mode.

Chapter 4: Testing

I Precaution

A. All valves of the water piping system are opened before starting this pool heat pump.
B. Do electric safety inspection before starting this pool heat pump.

II Inspect before Switch on the unit.

A. Check installation of the whole apparatus and pipeline connections according to the relevant plan.
B. Check the electrical connection according to the relevant diagram, check earth connection, power supply voltage is consistent to rated voltage and circuit breakage has effective action.
C. Check the piping system, the cable connection and cable size is correct.
D. Check the accessories installation is correct.
E. Keep the water circulation to be expedited.
F. Check the earth line connection is right.
G. Check the power supply, the voltage the same as the system rating voltage.
H. Check the supply and outflow of air and make sure no obstacle at air inlet and outlet.
I. Check the creepage protector works well.

III Trial

Using the LED controller (matched) to operate the unit, check the following points according to the instruction, and in case of failure, remedy according to the instruction.

A. Check the LED controller's switch on/off workable or not.
B. Check all the functions of the LED controller.
C. Check the indicator flashing normally.
D. Check water drainage & its' circulation
E. Check if it works normally in heating mode.
F. Check if there is abnormal vibration or sound during operation.
G. Check if the wind, noise and condensed water discharge will have bad influence to neighbors
H. Check if there is refrigerant leakage.

IV Requirement

A. For PH60 and bigger ones, please do not cut off power supply if it is needed to stop for one day all,because it need to operate the crankshaft heater to avoid the compressor starting compulsively.

B Make sure no block at the air inlet and outlet, otherwise the performance of the unit may be reduced and it may cause failure of starting protection.

V Relative instruction

A 3min protection

The unit cannot be restart immediately within 3 minutes after stop. It is normal and a self-protection of the compressor.

B Characteristics of heating operation

During operation, if ambient temperature is too high, the fan motor may operate in low stage.

C Defrost during heating condition

During heating condition, if there is frost in the machine, it may carry out defrost operation automatically for about 2-10min in order to improve heating performance

During defrost operation, the fan motor may be stopped.

D Operation condition of the unit

In order to make hot pump run correctly, please operate it at outdoor temperature 0~43℃.

E Power down memory function

Before each switch-off of the hot pump unit and the LED controller, the LED controller may remember condition of the unit automatically. After switch on again, the line controller may send switch on/off signals to the unit according to the memory. So the unit can operate as before.

F. Solution to abnormal condition

In case of following condition, please check before applying to repair:

	Phenomenon	Reason
Not failure	A. Noticeable White vaporous cold air or water. B. Plopping sound	A. The fan motor stops automatically for defrost. B. Sound from the solenoid valve when starting and ending of defrost. C. During operation or just stop, sound like water flow, and largely in 2~3 minutes of starting the machine. This Sound comes from flowing refrigerant or dehumidification. D. The plopping sound during the operation is caused by expand on heating and contract on cooling of the heat exchanger when temperature varies.
Recheck	Automatic start or stop	Check whether there is maloperation on the timer.
	No running	A. Power supply failure. B. Check manual power supply switch to make sure it is on. C. Fuse burned. D. If protector has started (operating light is on) E. Set timer on (the operating light is on)
	Running but not heating	Check if there is block on air inlet and outlet of the unit

Note: if the following conditions happen, please stop the machine immediately, and turn off the manual power supply switch, then the contact local dealer.

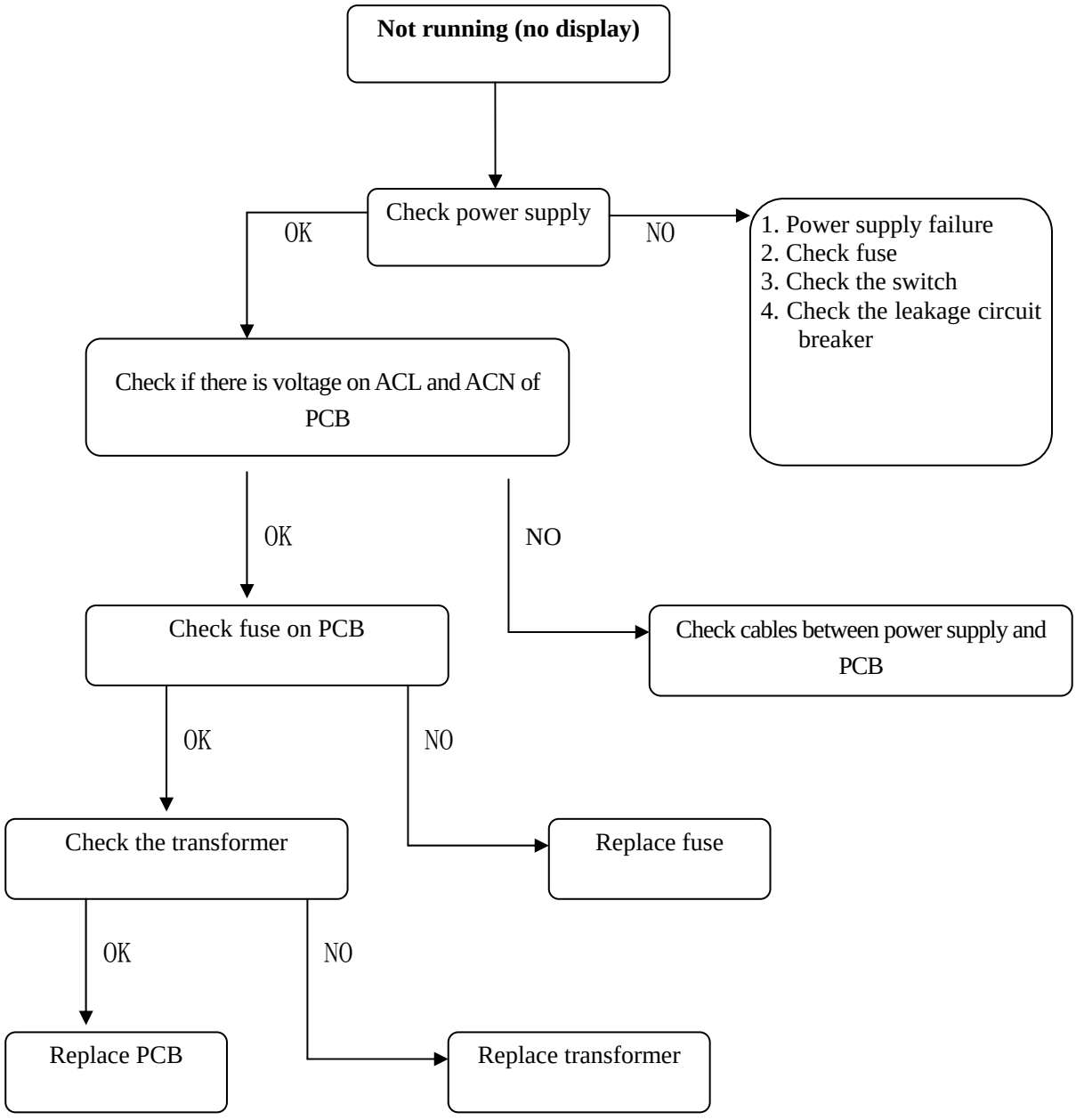
a）Inaccurate switch action.

b）The fuse is frequently broken or leakage circuit breaker jumped.

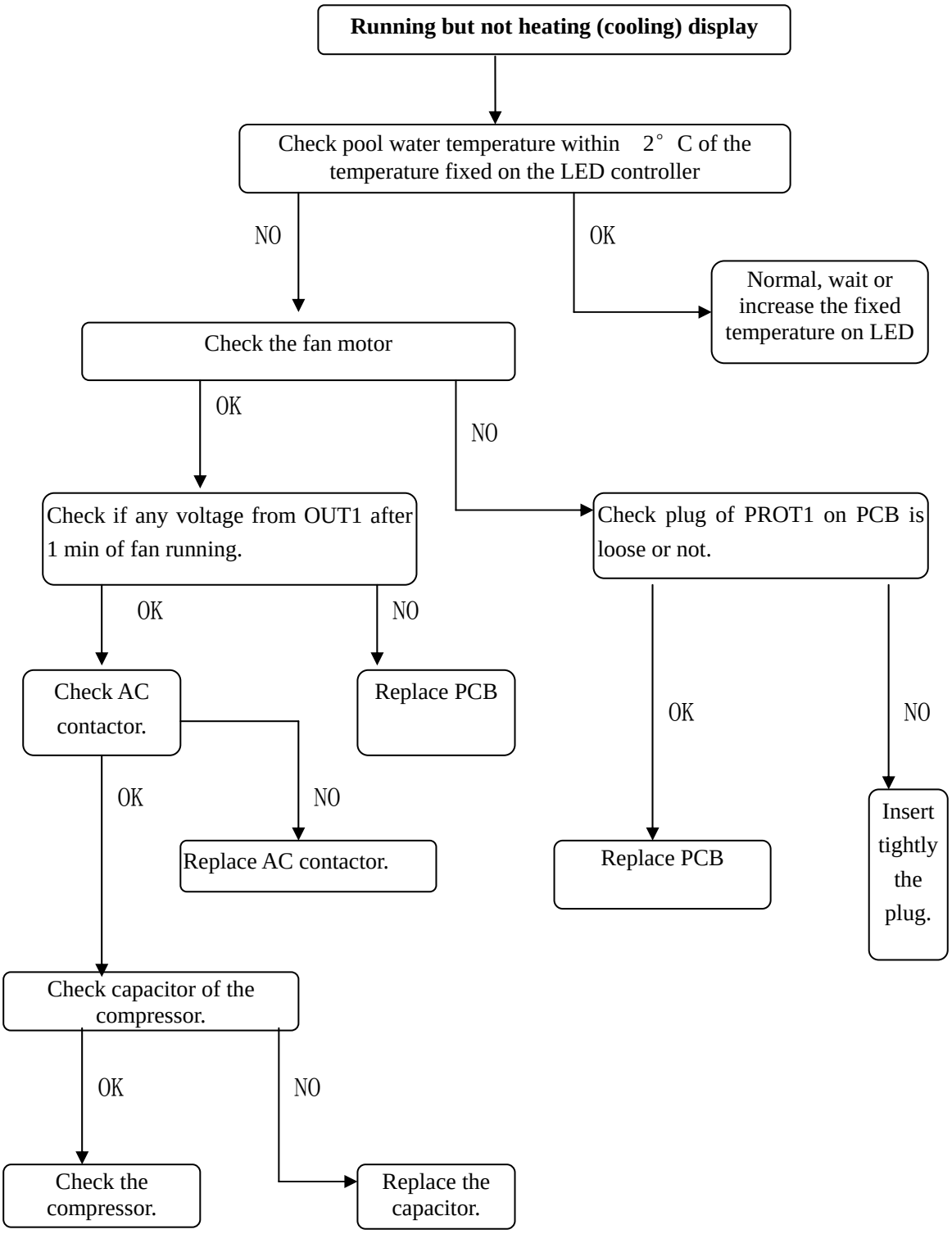
Chapter 5: Troubleshooting

I Procedure for failure checking

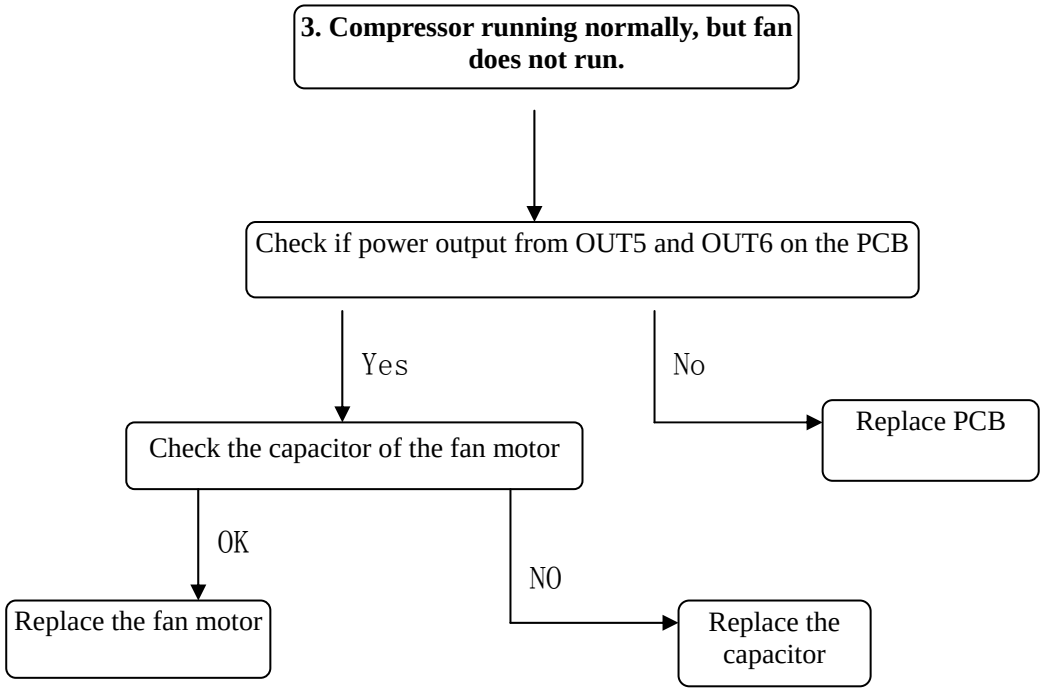
1. Heating pump not running:



2. Heating pump running but not cooling or heating:

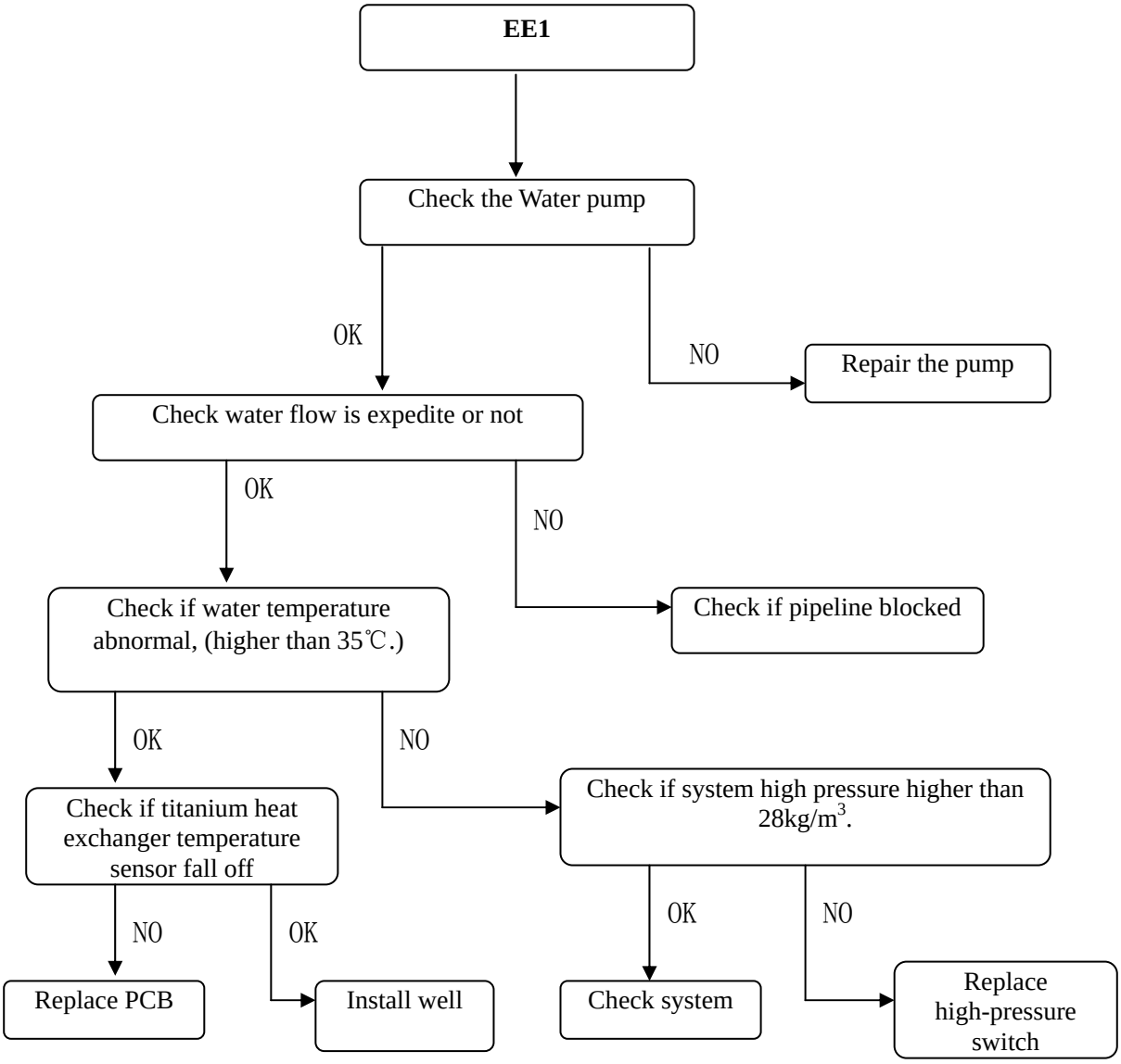


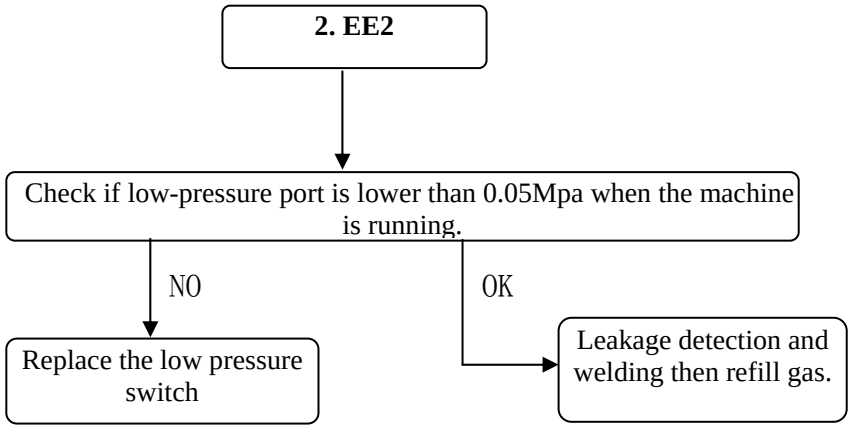
3. Compressor running normally, but fan does not run.

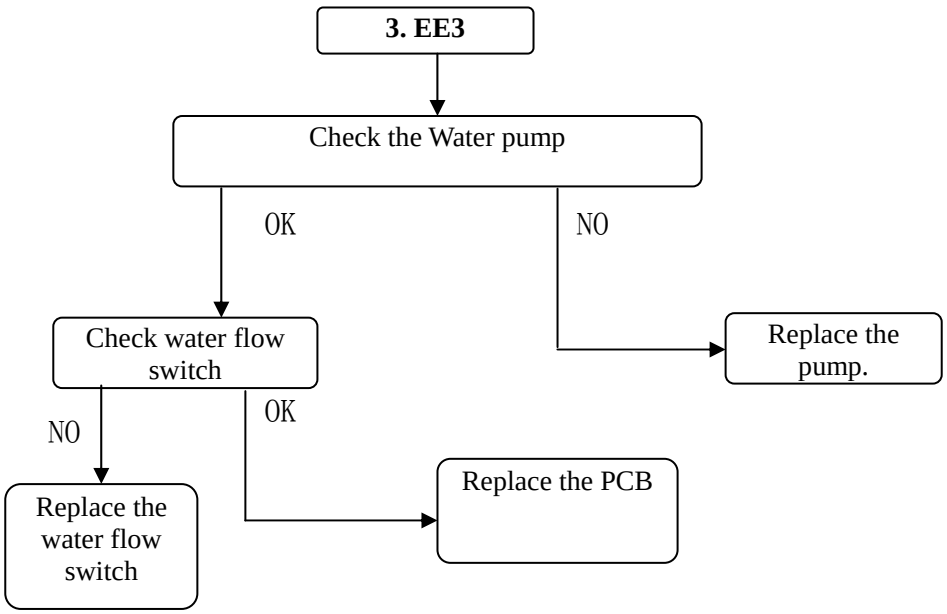

3. Compressor running normally, but fan does not run.
Check if power output from OUT5 and OUT6 on the PCB
Yes
No
Replace PCB
Check the capacitor of the fan motor
OK
NO
Replace the fan motor
Replace the capacitor

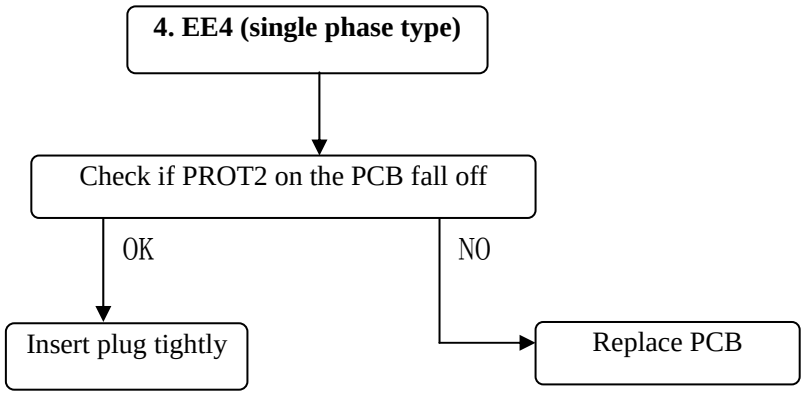
II Solution to failure code display on the LED

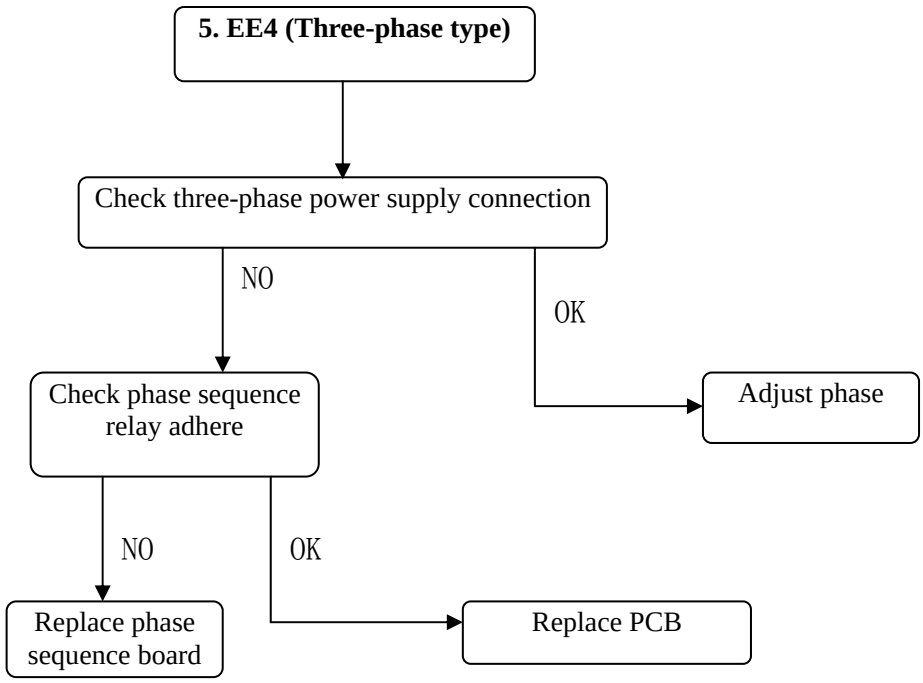
Failure code	Failure description
EE 1	System high-pressure protection
EE 2	System low-pressure protection
EE 3	Low/No water flux protection
EE 4	A: 1 phase machine: failure connection due to loose wire terminal of PROT2 on the PC board
	B: 3 phase machine :Three-phase sequence protection
PP 1	Pool water temperature sensor failure
PP 2	Exhausting temperature sensor failure
PP 3	Coil pipe temperature sensor failure
PP 4	Air return pipe temperature sensor failure
PP 5	Environment temperature sensor failure
PP 6	Compressor exhausting overheat protection

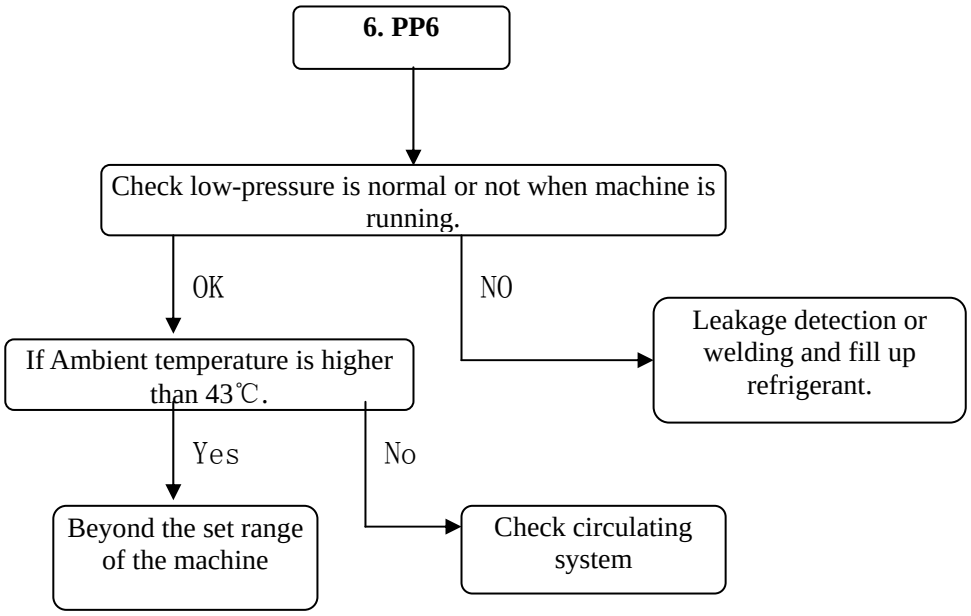

EE1
Check the Water pump
OK
NO
Repair the pump
Check water flow is expedite or not
OK
NO
Check if pipeline blocked
Check if water temperature abnormal, (higher than 35℃.)
OK
NO
Check if titanium heat exchanger temperature sensor fall off
Check if system high pressure higher than 28kg/m3.
NO
OK
OK
NO
Replace PCB
Install well
Check system
Replace high-pressure switch


2. EE2
Check if low-pressure port is lower than 0.05Mpa when the machine is running.
NO
OK
Replace the low pressure switch
Leakage detection and welding then refill gas.


3. EE3
Check the Water pump
OK
NO
Check water flow switch
Replace the pump.
NO
OK
Replace the water flow switch
Replace the PCB


4. EE4 (single phase type)
Check if PROT2 on the PCB fall off
OK
NO
Insert plug tightly
Replace PCB


5. EE4 (Three-phase type)
Check three-phase power supply connection
NO
OK
Check phase sequence relay adhere
Adjust phase
NO
OK
Replace phase sequence board
Replace PCB


6. PP6
Check low-pressure is normal or not when machine is running.
OK
NO
Leakage detection or welding and fill up refrigerant.
If Ambient temperature is higher than 43℃.
Yes
No
Beyond the set range of the machine
Check circulating system

1 If display PP1, PP2, PP3, PP4 and PP5, check relative temperature sensor plug and insert well; if still problems, please replace the pertinent temperature sensor.

2 If displaying PP7, not failure. Ambient temperature is lower than 0℃, which is beyond design of the machine. It is self-protection.

3 Frequent failure in circulating system

Higher high-pressure and lower low-pressure

Reason:

a. Lack of vacuum after repairing, or too much or less refrigerant injected.

b Electric expanding valve failure.

c Block on filter of the gas piping system.

How to diagnose:

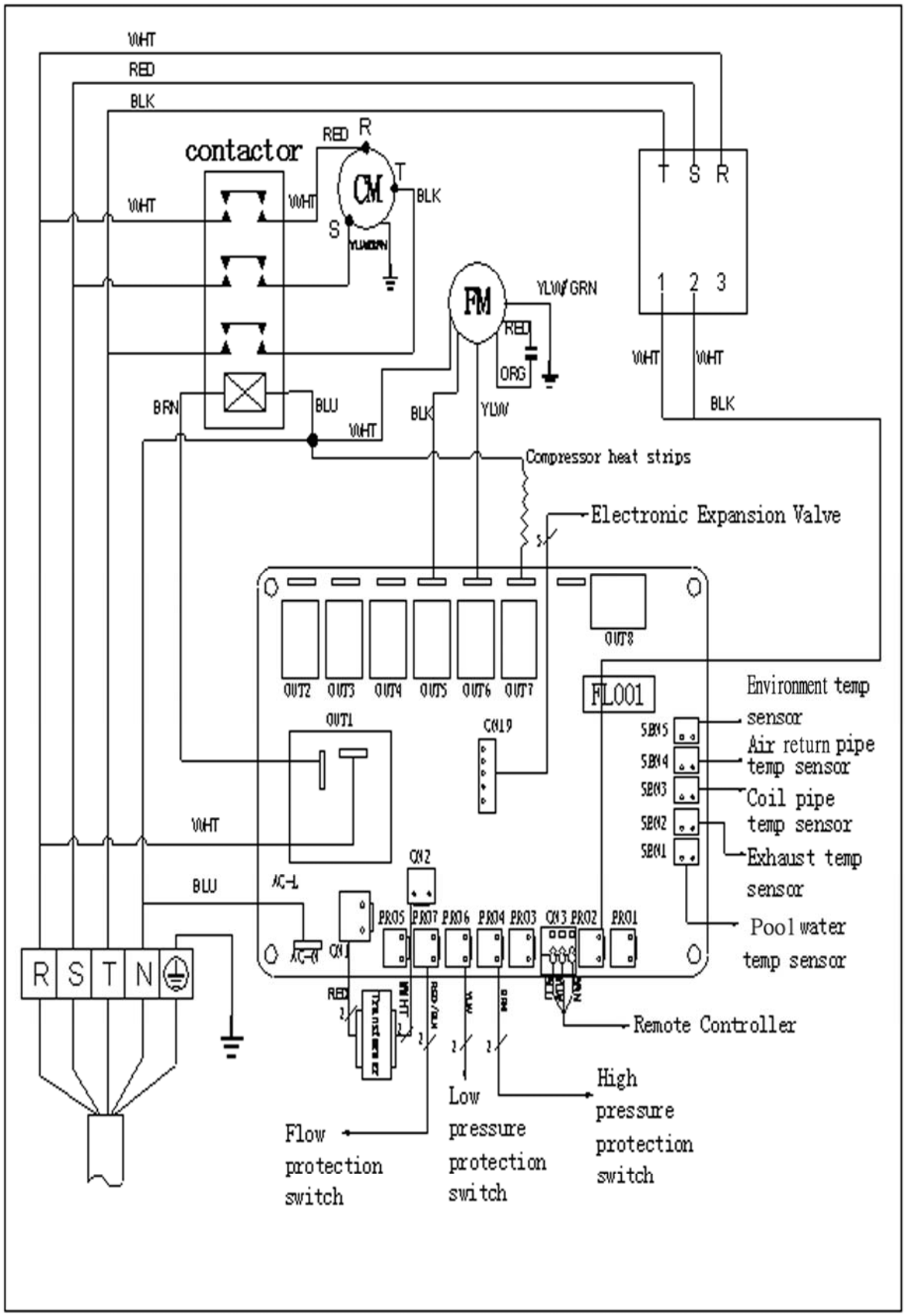
a If lack of vacuum, the index of high-pressure or low-pressure gauge vibrating very fast.

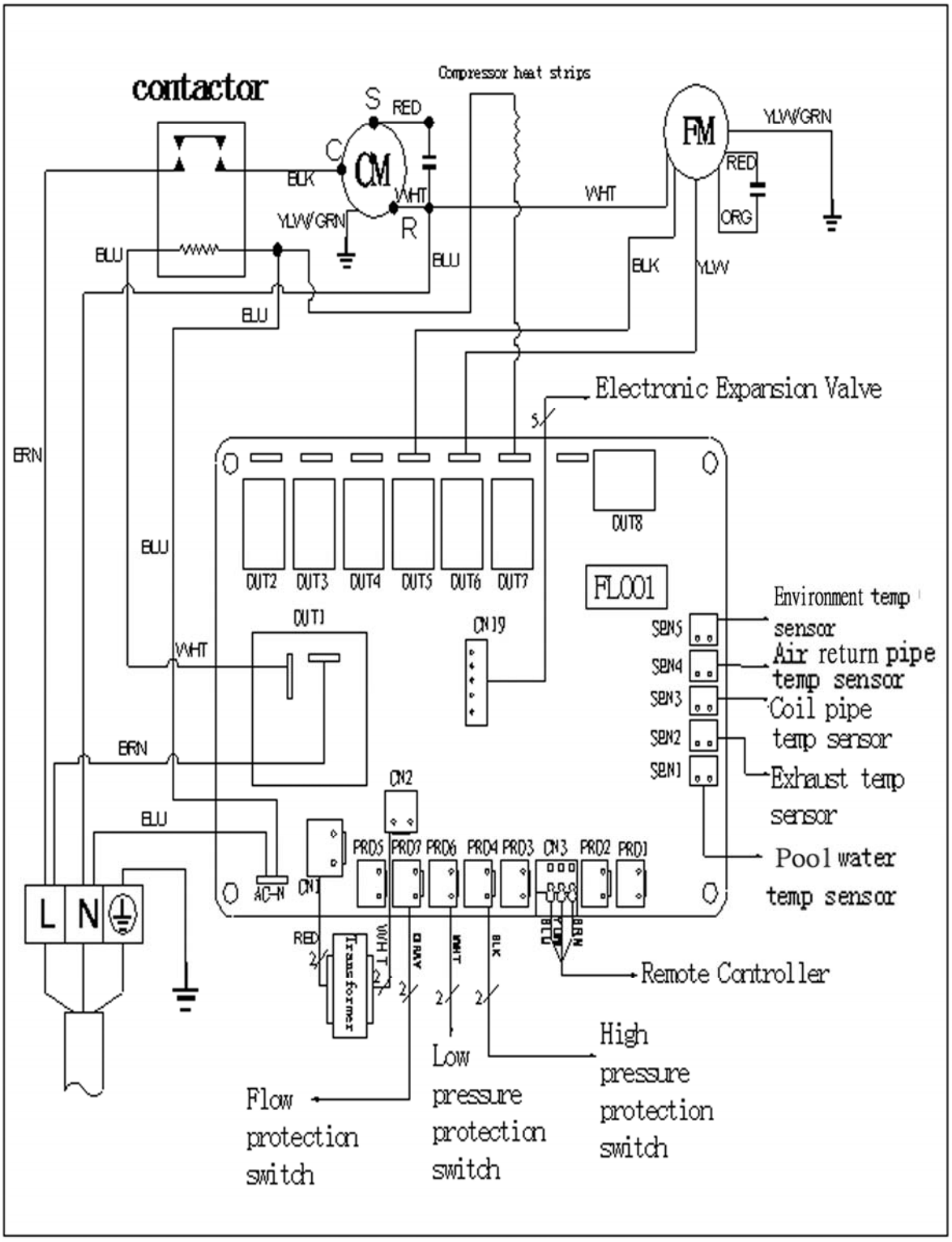
b If refrigerant overfull or lack, low-pressure may be too high or too low.

c Frost on outlet of the expansion valve and not thaw due to electric expansion valve failure.

d Frost on filter point and not thaw due to the blocked filter.

III Machine system connection diagram

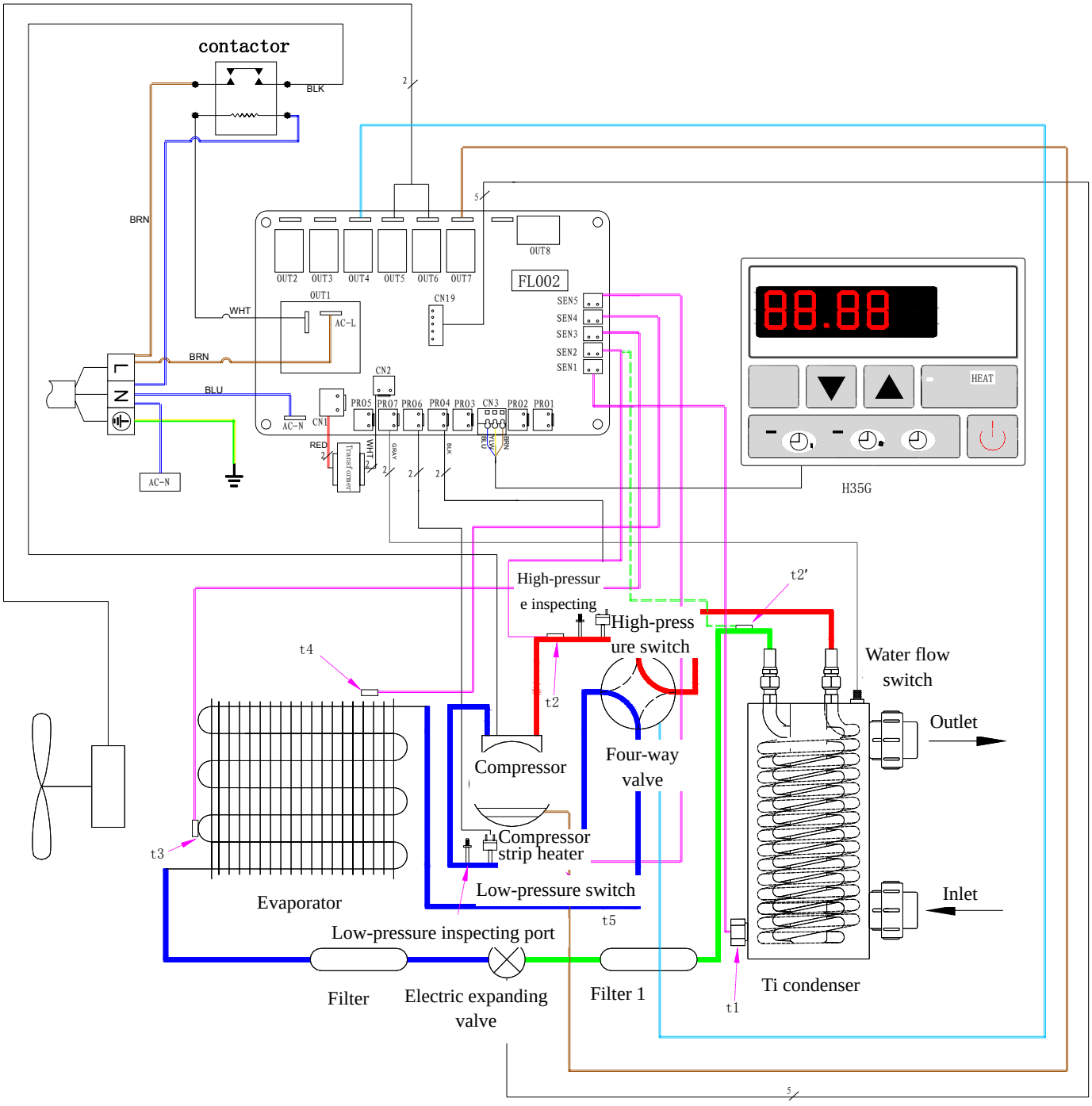




Instruction

1 There is no strip heater for the compressor in types under PH45 (included).

2 There is no AC contactor in types under PH20 (included).



Instruction

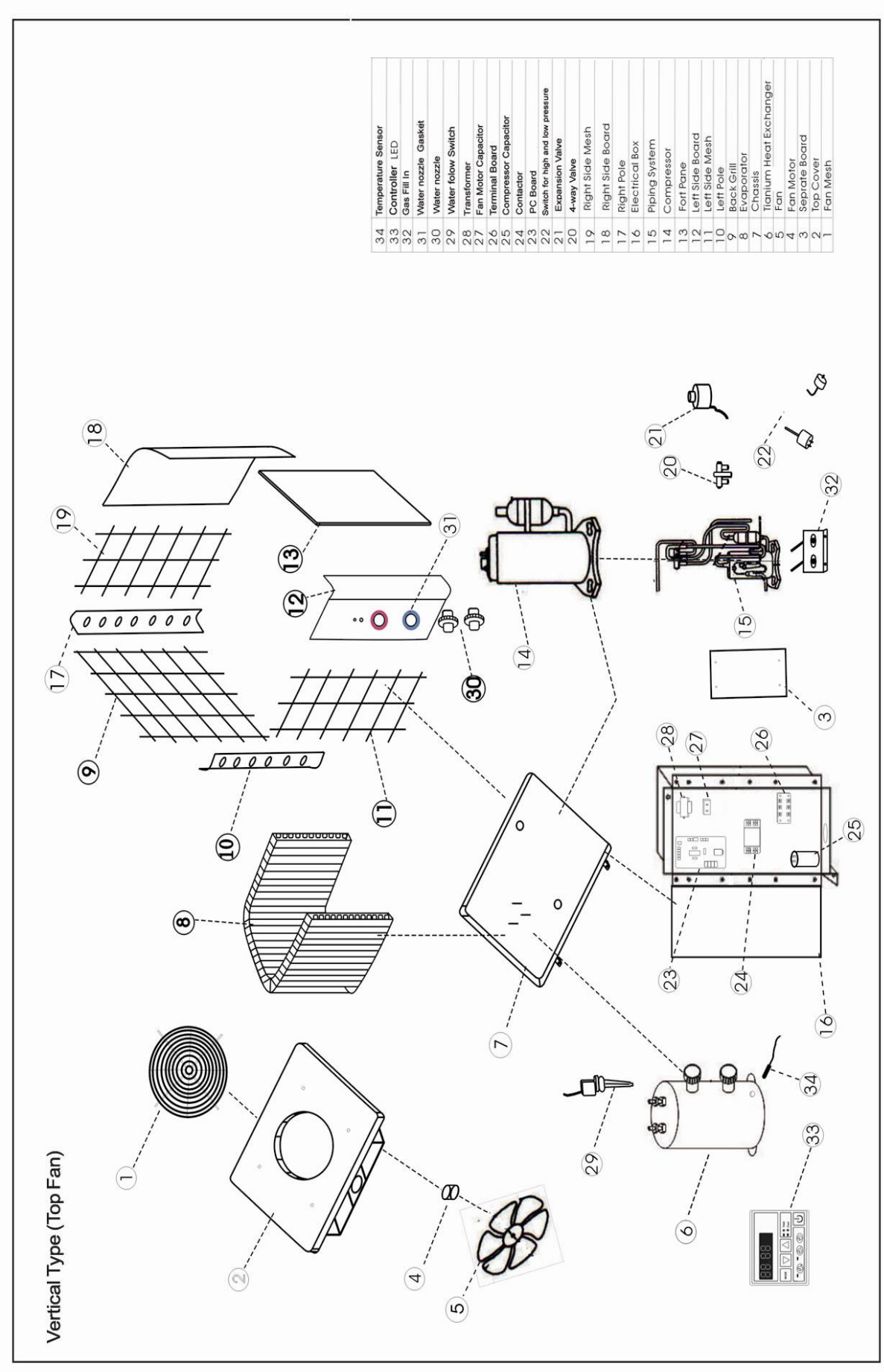
1 The LED controller type of PHC heat and cool unit is HC35G and circuit board type is FL003. change 2 to t2'; parameter of t2 is 10k, and parameter of t2' is 5k.

2 There is no filter 2 in PH single heat type.

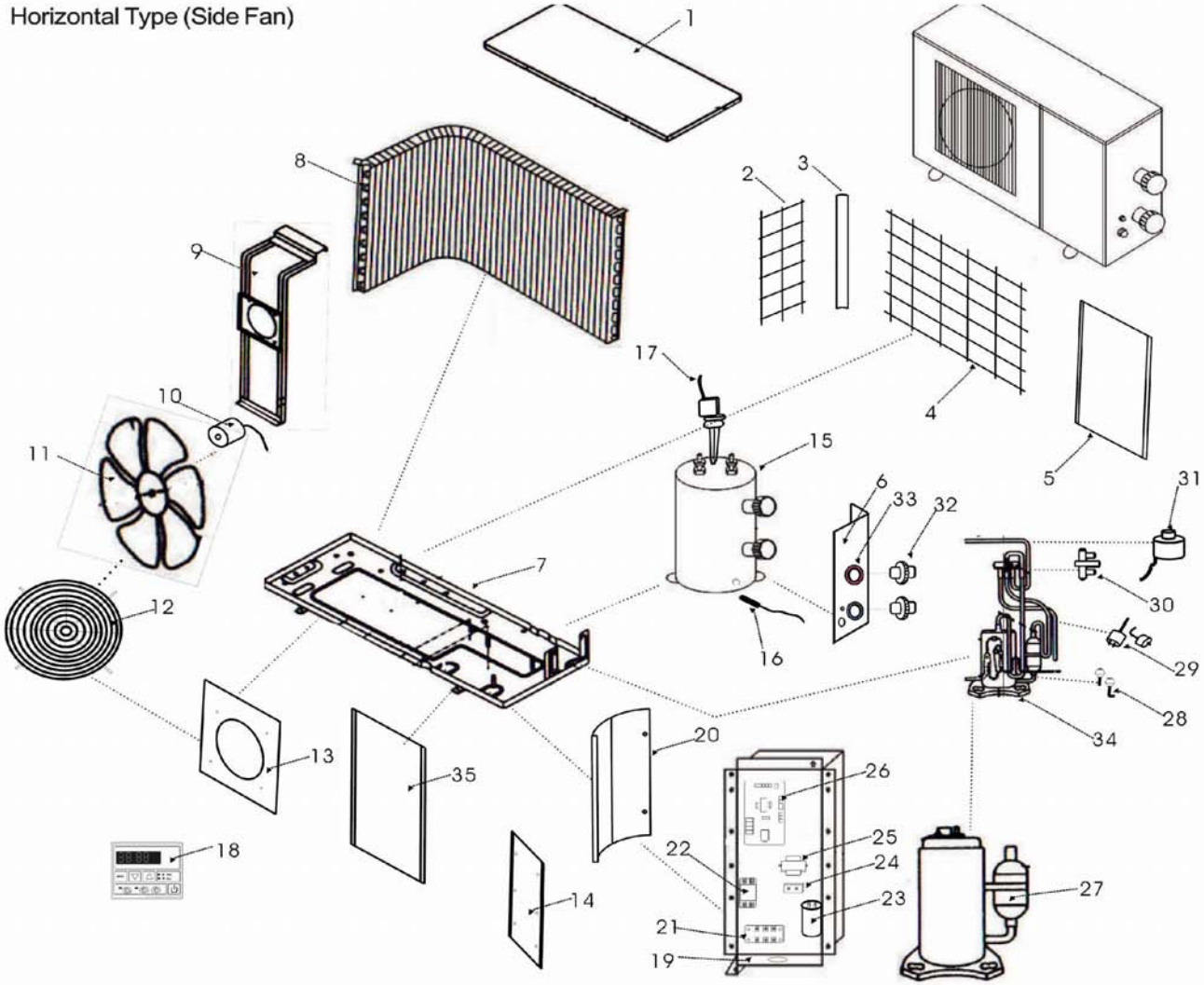
3 There is no strip heater for the compressor in types under/included PH45.

4 There is no AC contactor in types under/included PH20 .

IV Components assembly diagram



Horizontal Type (Side Fan)



35	Front Panel
34	Piping System
33	Water nozzle Gasket
32	Water nozzle
31	Expansion Valve
30	4-way Vale
29	Switch for high and low pressure
28	Gas Fill In
27	Compressor
26	PC Board
25	Transformer
24	Fan Motor Capacitor
23	Compressor Capacitor
22	Contactor
21	Terminal Board
20	Separate Board
19	Electrical Box
18	LED Controler
17	Water flow Switch
16	Temperature Sensor
15	Tianium Heat Exchanger
14	Cover for Electrical Box
13	Fan Font Panel
12	Fan Mesh
11	Fan
10	Fan Motor
9	Fan Bracket
8	Evaporator
7	Chassis
6	Right Side Board
5	Back Pane
4	Back Grill
3	Back Pole
2	Left Side Mesh
1	Top Cover

Contact us

When you contact us for assistant, please have the following information ready and we will do our best to solve.

Model Number: _____

Serial number: _____

Installation date (If known):_____

Full Logical description of the problem or issue:_____

(best have some pictures enclosed to demonstrate the problem you account)

_____

_____

Thank you!

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